SEMESTER END EXAMINATION, DECEMBER 2024

Course Name: - B. Tech (CSE) Semester: - 5th

Paper Name: - Artificial Intelligence Paper Code: - TCS 501

Time - 3Hrs + 20 minutes per hour extra time for V.I. & examinees with writer. Max Marks-70

समय – 3 घण्टे 20 मिनट प्रति घंटे अतिरिक्त–दृष्टिबाधित एवं सहलेखक परीक्षार्थियों के लिए। अधिकतम अंक–70

Instructions:

- The question paper consists of three sections namely A, B, C. All sections are compulsory.
- Section A- Each question carries **03** marks. All questions are compulsory.
- Section B- Answer any **5 out of 7** given questions in maximum hundred **(150) words**. Each question carries **7 marks.**
- Section C- Answer any **2 out of 3** given questions in maximum one hundred fifty **(500) words**. Each question carries **10 marks.**

Section – A खण्ड–अ
Objective Questions

1. Answer all the following questions. 5×3=15

निम्नलिखित सभी प्रश्न अनिवार्य हैं।

(i) A key property of Markov Decision Processes is:
a) Independence of past states given the present
b) Dependence on all previous states
c) Stochastic state transitions
d) Deterministic rewards

(ii) Which search algorithm is primarily used for adversarial games?
a) Breadth-first search
b) Minimax
c) Random search
d) Iterative deepening

(iii) The heuristic function h(n) is used in:
a) BFS
b) DFS
c) A*
d) Random search

(iv) In probabilistic reasoning, evidence refers to:
a) Observed data
b) Predicted outcomes
c) Prior probabilities
d) Conditional probabilities

(v) In direct utility estimation, the utility of a state is calculated by:
a) Summing up rewards received from that state
b) Averaging rewards over all episodes
c) Maximizing future rewards
d) Estimating transition probabilities

Section – B खण्ड–ब
Short Answer Questions (लघुउत्तरीय प्रश्न)

2.Answer any five of the following questions in maximum 150 words. 5×7=35

निम्नलिखित में से किन्हीं 5 प्रश्नों के उत्तर अधिकतम 150 शब्दों में दें।

i) What is problem formulation in AI? Discuss the key components involved in formulating an AI problem, including goals, actions, and performance measures.?

ii) Explain the concept of an intelligent agent in AI. Briefly describe Simple Reflex Agent and Model Based Reflex Agent.

iii) What is adaptive dynamic programming? How does it help in solving reinforcement learning problems?

iv) Differentiate between depth-first search (DFS) and breadth-first search (BFS). Highlight their advantages and limitations.

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v) Differentiate between goal-based agents, utility-based agents, and learning agents. Use relevant examples to support your explanation.

vi) Explain state space representation with an example? How is it used in formulating AI problems?

vii) Consider a Bayesian Network with the following setup:

1. **Rain (R)**: Can either be True (T) or False (F).
2. **Sprinkler (S)**: Depends on whether it rains. It can also be True (T) or False (F).
3. **Wet Grass (W)**: Depends on both Rain and Sprinkler, and can also be True (T) or False (F).

The probabilities are given as:

- P(R=T)=0.2,P(R=F)=0.8
- P(S=T|R=T)=0.01,P(S=T|R=F)=0.4
- P(W=T|R=T,S=T)=0.99,P(W=T|R=T,S=F)=0.8
- P(W=T|R=F,S=T)=0.9,P(W=T|R=F,S=F)=0.0

Question:

Using the given probabilities, calculate P(W=T), the probability that the grass is wet.

Section – C खण्ड–स
Descriptive Questions

3.Answer any 02 question of the following question in maximum 500 words. 2×10=20

निम्नलिखित में से किन्हीं 2 प्रश्न के उत्तर अधिकतम 500 शब्दों में दें।

i) Scenario :

Consider a self-driving car navigating through a busy city with pedestrians, traffic lights, and unpredictable vehicle behaviour. The car needs to make real-time decisions based on sensor inputs.

Question:

Explain what kind of agent the self-driving car would be and describe how it would handle the challenges of a stochastic and dynamic environment. Discuss the role of sensors and actuators in its decision-making process.

ii) Given the following initial configuration of an 8-puzzle:

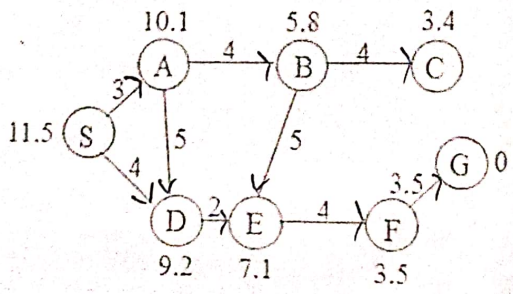
```
1 2 3
4 5 6
8 7 0
```

Where 0 represents the empty space. The goal is to reach the following target configuration:

```
1 2 3
8 0 4
7 6 5
```

calculate the minimum number of moves required to solve this 8-puzzle

iii) Consider the following directed graph, having S as the starting node and G as the goal node, with edge costs and Heuristic Cost as mentioned. Explain the step-by-step procedure of the A algorithm* for finding the shortest path from S to G. Include the necessary calculations and the role of the heuristic function.



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